

Claims

We Claim:

1. A method for producing a polymer drag reducing agent, comprising:
mixing a monomer and a catalyst in at least one continuously stirred tank reactor (CSTR) to form a mixture;
continuously injecting the mixture into a volume continuously formed by a thermoplastic material;
periodically sealing off the thermoplastic material into a temporary container;
permitting the monomer to polymerize in the temporary container to form polymer; and
grinding the polymer and the temporary container to produce particulate polymer drag reducing agent.
2. The method of claim 1 where in the continuous injecting, the thermoplastic material is low density polyethylene.
3. The method of claim 1 where in the periodic sealing off of the thermoplastic material, the point at which the sealing occurs to form the temporary container is selected from the group consisting of (1) the mixture reaching a predetermined viscosity, (2) the polymer reaching a predetermined molecular weight, and (3) a combination of (1) and (2).
4. The method of claim 1 where in permitting the monomer to polymerize in the temporary container, the containers are placed in an inert environment.
5. The method of claim 4 where in the permitting the monomer to polymerize in the temporary container, the inert environment is a bath of circulated fluid that removes heat of polymerization from the polymer.

6. The method of claim 1 where in grinding the polymer and the temporary container, the grinding is conducted at a temperature above the glass transition temperature of the polymer.
7. The method of claim 1 where in grinding the polymer and the temporary container, the grinding is conducted in the presence of a grinding aid.
8. The method of claim 7 where in grinding the polymer and the temporary container, the grinding aid is a solid organic grinding aid having a size between about 1 and about 50 microns.
9. The method of claim 7 where in grinding the polymer and the temporary container, the grinding aid is selected from the group consisting of ethene/butene copolymer, paraffin waxes, solid alcohols, and mixtures thereof.
10. The method of claim 7 where in grinding the polymer and the temporary container, a portion of the ground temporary container and a portion of excess grinding aid, if any, are removed from the ground polymer.
11. The method of claim 1 further comprising combining the particulate polymer drag reducing agent with a dispersing fluid to form a slurry product.
12. The method of claim 1 where in combining the particulate polymer drag reducing agent with a dispersing fluid, the dispersing fluid is a mixture of at least two hydrocarbon fluids comprising a first fluid having a melting point above a melting point of a second fluid.
13. The method of claim 12 where in the dispersing fluid, the first fluid ranges from about 30 wt % to about 35 wt % and the second fluid ranges from about 40 wt % to about 45 wt % based on the total volume of the dispersing fluid.

14. The method of claim 12 where the first fluid is petrolatum.
15. The method of claim 1 where in mixing the monomer and the catalyst, the monomer is an alpha-olefin.
16. The method of claim 1 where in the grinding, the particulate polymer drag reducing agent has an average particle size of equal to or less than about 600 microns.
17. The method of claim 1 where in the grinding, the grinding is conducted in the absence of cryogenic temperatures.
18. The method of claim 1 where in the grinding, the grinding is conducted at ambient temperatures.
19. A method for producing a polymer drag reducing agent, comprising:
mixing a monomer and a catalyst in at least one continuously stirred tank reactor (CSTR) to form a mixture;
continuously injecting the mixture into a volume continuously formed by a thermoplastic material;
periodically sealing off the thermoplastic material into a temporary container;
permitting the monomer to polymerize in the temporary container in an inert environment to form polymer; and
grinding the polymer and the temporary container at a temperature above the glass transition temperature of the polymer to produce particulate polymer drag reducing agent.
20. The method of claim 19 where in the continuous injecting, the thermoplastic material is low density polyethylene.

21. The method of claim 19 where in the periodic sealing off of the thermoplastic material, the point at which the sealing occurs to form the temporary container is selected from the group consisting of (1) the mixture reaching a predetermined viscosity, (2) the polymer reaching a predetermined molecular weight, and (3) a combination of (1) and (2).
22. The method of claim 19 where in the permitting the monomer to polymerize in the temporary container, the inert environment is a bath of circulated fluid that removes heat of polymerization from the polymer.
23. The method of claim 19 where in grinding the polymer and the temporary container, the grinding is conducted in the presence of a grinding aid.
24. The method of claim 23 where in grinding the polymer and the temporary container, the grinding aid is selected from the group consisting of ethene/butene copolymer, paraffin waxes, solid alcohols, and mixtures thereof.
25. The method of claim 23 where in grinding the polymer and the temporary container, a portion of the ground temporary container and a portion of excess grinding aid, if any, are removed from the ground polymer.
26. The method of claim 19 further comprising combining the particulate polymer drag reducing agent with a dispersing fluid to form a slurry product.
27. The method of claim 19 where in combining the particulate polymer drag reducing agent with a dispersing fluid, the dispersing fluid is a mixture of at least two hydrocarbon fluids comprising a first fluid having a melting point above a melting point of a second fluid.

28. The method of claim 27 where in the dispersing fluid, the first fluid ranges from about 30 wt % to about 35 wt % and the second fluid ranges from about 40 wt % to about 45 wt % based on the total volume of the dispersing fluid.
29. The method of claim 19 where in the grinding, the particulate polymer drag reducing agent has an average particle size of equal to or less than about 600 microns.
30. The method of claim 19 where in the grinding, the grinding is conducted in the absence of cryogenic temperatures.
31. The method of claim 19 where in the grinding, the grinding is conducted at ambient temperatures.
32. A slurry of particulate polymer drag reducing agent comprising:
a particulate polymer drag reducing agent; and
a dispersing fluid, where the dispersing fluid comprises:
a first hydrocarbon fluid; and
a second hydrocarbon fluid, where the first hydrocarbon fluid has a melting point above the melting point of second hydrocarbon fluid.
33. The slurry of claim 32 where in the dispersing fluid, the first fluid ranges from about 30 wt % to about 35 wt % and the second fluid ranges from about 40 wt % to about 45 wt % based on the total volume of the dispersing fluid.
34. The slurry of claim 32 where the first fluid is petrolatum.
35. The slurry of claim 32 where the particulate polymer drag reducing agent is polyalpha-olefin.

36. The slurry of claim 32 where the particulate polymer drag reducing agent has an average particle size of equal to or less than about 600 microns.
37. The slurry of claim 32 further comprising a grinding aid.
38. The slurry of claim 37 where the grinding aid is a solid organic grinding aid having a size between about 1 and about 50 microns.
39. The slurry of claim 37 where the grinding aid is selected from the group consisting of ethene/butene copolymer, paraffin waxes, solid alcohols, and mixtures thereof.
40. A slurry of particulate polymer drag reducing agent comprising:
a particulate polyalpha-olefin drag reducing agent having an average particle size of equal to or less than about 600 microns; and
a dispersing fluid, where the dispersing fluid comprises:
a first hydrocarbon fluid; and
a second hydrocarbon fluid, where the first hydrocarbon fluid has a melting point above the melting point of second hydrocarbon fluid.
41. The slurry of claim 40 where in the dispersing fluid, the first fluid ranges from about 30 wt % to about 35 wt % and the second fluid ranges from about 40 wt % to about 45 wt % based on the total volume of the dispersing fluid.
42. The slurry of claim 40 where the first fluid is petrolatum.
43. The slurry of claim 40 further comprising a grinding aid.
44. The slurry of claim 43 where the grinding aid is a solid organic grinding aid having a size between about 1 and about 50 microns.

45. The slurry of claim 43 where the grinding aid is selected from the group consisting of ethene/butene copolymer, paraffin waxes, solid alcohols, and mixtures thereof.